APTD-0811

PB 207 686

ATLANTA METROPOLITAN AREA AIR POLLUTANT EMISSION INVENTORY

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Consumer Protection and Environmental Health Service

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
Springfield, Va 22151

57

R

BIBLIOGRAPHIC DATA SHEET	1. Report No. APTD-0811	2.	3. Recipient's Accession No.
4. Title and Subtitle Atlanta Metropolitan Area Air Pollutant Emission Inventory			5. Report Date October 1969 6.
7. Author(s) David V. Mason			8. Performing Organization Rept. No.
9. Performing Organization Name and Address U. S. Department of Health, Education, and Welfare National Air Pollution Control Administration Division of Air Quality and Emission Data Durham, North Carolina			10. Project/Task/Work Unit No. 11. Contract/Grant No.
12. Sponsoring Organization Name and Address Same			13. Type of Report & Period Covered 14.

15. Supplementary Notes

16. Abstracts

A report is presented of the emission inventory of the Atlanta Metropolitan Area. Estimates are provided of total emissions of oxides of sulfur, oxides of nitrogen, hydrocarbons, carbon monoxide and particulate matter. The emissions of these pollutants are delineated with respect to source type, season of the year as well as their geographical distribution with the area. These surveys are also intended to determine the present level of emissions and status of their control. The general procedure for the survey is based on the rapid survey technique. The emissions are expressed in terms of tons of pollutants for an average annual, summer, and winter day.

17. Key Words and Document Analysis. 17a. Descriptors

Air pollution
Emission
Inventories
Sulfur oxides
Nitrogen oxides
Hydrocarbons
Carbon monoxide
Particles
Seasonal variations
Sources
Transportation
Waste disposal
Industrial plants

17b. Identifiers/Open-Ended Terms

Atlanta, Georgia
Particulates
Stationary sources

17c. COSATI Field/Group 13B

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Unlimited	UNCLASSIFIED	55
	20. Security Class (This Page) UNCLASSIFIED	22. Price

FORM NTIS-35 (10-70)

USCOMM-DC 40329-P71

ATLANTA AIR POLLUTANT EMISSION INVENTORY

Prepared by

David V. Mason

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
PUBLIC HEALTH SERVICE
Consumer Protection and Environmental Health Service
National Air Pollution Control Administration
Division of Air Quality and Emission Data
Durham, North Carolina
October, 1969

ACKNOWLEDGMENTS

We would like to thank all cooperating agencies that helped in the gathering of the data for this report. In particular, we are grateful for the use of data and personnel assistance furnished by the Air Pollution Control Section of the Fulton County Health Department and the Air Quality Control Branch of the Georgia Department of Public Health.

TABLE OF CONTENTS

	Page
PREFACE	1
INTRODUCTION	2
SUMMARY OF RESULTS	3
STUDY AREA	6
GRID COORDINATE SYSTEM	12
EMISSIONS BY CATEGORY	14
Fuel Combustion in Stationary Sources	14
Emissions from Fuel Combustion	18
Data Sources	18
Transportation	21
Road Vehicles	21
Aircraft	21
Railroads and Vessels	21
Solid Waste Disposal	21
Industrial Process Losses	22
EMISSIONS BY JURISDICTION	30
EMISSIONS BY GRID	38
EMISSION DENSITIES BY GRID	44
REFERENCES	49

LIST OF TABLES

TABLE		Page
1	Summary of Air Pollution Emissions	5
2	Population Statistics	7
3	Industrial Establishments by County	8
4	Summary of Coal Consumption	15
5	Summary of Fuel Oil Consumption	16
6	Summary of Natural Gas Consumption	17
7	Chemical Analysis of Fuels	19
8	Summary of Emissions From Fuel Burning in Stationary Sources	20
9	Vehicle-Miles travel in Atlanta Study Area	23
10	Gasoline and Diesel Consumption in Atlanta Study Area	24
11	Air Activity at the Atlanta Area Airports, 1968	25
12	Summary of Transportation Emissions	26
13	Refuse Balance for Study Area	27
14	Air Pollutant Emissions from Solid Waste Disposal	28
15	Air Pollutant Emissions from Process Emission Sources	29
16	Summary of Emissions for Clayton County	31
17	Summary of Emissions for Cobb County	32
18	Summary of Emissions for DeKalb County	33
19	Summary of Emissions for Douglas County	34
20	Summary of Emissions for Fulton County	35
21	Summary of Emissions for Gwinnett County	36
22	Summary of Emissions for Henry County	37
23	Summary of Emissions from Point Sources	40
24	Emissions from Total Sources in the Atlanta Study Area	41

LIST OF FIGURES

		Page
Figure 1	Map of the Atlanta Study Area.....	9
Figure 2	Detailed Map of the Atlanta Study Area.....	10
Figure 3	Population Density Map.....	11
Figure 4	Grid Coordinate System for the Atlanta Study Area.....	13
Figure 5	Point Source Location Map.....	39
Figure 6	Sulfur Oxides Emission Density Map.....	44
Figure 7	Particulate Emission Density Map.....	45
Figure 8	Carbon Monoxide Emission Density Map.....	46
Figure 9	Hydrocarbon Emission Density Map.....	47
Figure 10	Nitrogen Oxides Emission Density Map.....	48

PREFACE

This report, which presents the emission inventory of the Atlanta metropolitan area, is another in a series of studies outlining the sources and emissions of air pollutants for major metropolitan areas in the country. These reports provide estimates of total emissions of oxides of sulfur, oxides of nitrogen, hydrocarbons, carbon monoxide and particulate matter. The emissions of these pollutants are delineated with respect to source type, season of the year as well as their geographical distribution within the area. These surveys are also intended to determine the present level of emissions and status of their control.

The general procedure for these surveys is based on the rapid survey technique.[1] The Study Area is divided into grid zones that serve as the basis for locating sources and reporting their emissions. All sources of pollutants are divided into two subgroups--point and area sources. Sources that emit large quantities of air pollutants are considered individually and located specifically within the area. This latter group which generally contains about fifty to one hundred sources typically includes large industries, power plants, and central refuse burning facilities. The remaining multitude of sources are considered collectively as area source and their emissions are reported as totals for grid zones. This category includes motor vehicles, home heating, smaller industries, on-site refuse burning, etc. The emissions in both cases are expressed in terms of tons of pollutants for an average annual, summer, and winter day.

Emissions for the most part are estimated using various indicators of pollutant emissions and average emission factors that are related to these. This means that information and data are collected on fuel consumption, refuse burning rates, vehicle miles and gasoline consumption, as well as various production data. These are then translated into emission estimates by use of average emission factors.[2] These factors, for the most part, represent average emission rates for a particular industry or fuel type.

INTRODUCTION

The information and data presented in this report were gathered in cooperation with the acknowledged local agency during a survey conducted in July, 1969. The data obtained in this study is for the most part, representative of 1968 and emission estimates presented herein should be considered as showing the conditions during 1968.

For purposes of this survey, the Study Area consists of seven counties surrounding the city of Atlanta, Georgia. The entire area covers some 2100 square miles and includes a 1968 population of about 1,300,000 people. The Study Area is subdivided into 61 grid zones ranging in size from 25 square kilometers to 400 square kilometers.

Any individual source which had emissions significant to the overall pollution was classified as a point source and located specifically in the aforementioned grid zones.

The remaining single sources were added to the area sources and reported as grid totals.

Because of the inherent difference in type of equipment, operating rates, control equipment, and efficiency of operation among the plants and fuel users within a given category, the application of the emission factors to any individual plant or even a smaller number of similar plants or processes may result in a discrepancy between the actual and the estimated emissions. However, the estimates of total pollutants from all sources in the study area should be reasonably accurate since the emission factors are based on average conditions.

SUMMARY OF RESULTS

As estimated 650 thousand tons of the five pollutants are emitted annually in the Study Area. The breakdown of these emissions by type of pollutant and source category are summarized in Table 1. The following is a brief summary of pollutant emissions as presented in Table 1.

Sulfur Oxides	1968 Total - 69,000 Tons	
	Steam-Electric	91%
	Industrial Fuel	2%
	Road Vehicles	2%
	Other	5%
Particulates	1968 Total - 47,000 Tons	
	Steam-Electric	47%
	Refuse Disposal	25%
	Transportation	15%
	Industrial Process	10%
	Other	3%
Carbon Monoxide	1968 Total - 414,000 Tons	
	Road Vehicles	89%
	Aircraft	5%
	Refuse Disposal	5%
	Other	1%
Hydrocarbons	1968 Total - 61,000 Tons	
	Transportation	87%
	Industrial Process	11%
	Other	2%

Nitrogen Oxides	1968 Total - 65,000 Tons	
	Steam-Electric	33%
	Road Vehicles	33%
	Industrial Process	13%
	Aircraft	6%
	Refuse Disposal	5%
	Industrial Fuel	5%
	Other	5%

EMISSIONS BY POINT SOURCES

Oxides of Sulfur	94%
Particulates	75%
Carbon Monoxide	7%
Hydrocarbons	20%
Oxides of Nitrogen	54%

TABLE 1 SUMMARY OF AIR POLLUTANT EMISSIONS FOR THE ATLANTA STUDY AREA, 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbon	Nitrogen Oxides
Transportation	1,900	7,000	384,500	52,650	25,250
Road Vehicles	1,900	3,350	363,000	29,250	21,650
Evaporation	--	--	--	18,200	--
Other	--	3,650	21,500	5,200	3,600
Combustion of Fuels by Stationary Sources	66,250	23,750	1,550	400	27,750
Industry	1,900	900	50	--	3,100
Steam-Electric	62,750	22,000	500	200	21,800
Residential	1,150	500	750	150	1,600
Commercial	450	350	250	50	1,250
Refuse Disposal	850	11,050	20,400	1,300	3,500
Incineration	850	7,300	400	100	900
Open Burning	--	3,750	20,000	1,200	2,600
Industrial Process Emissions	50	4,900	7,900	6,600	8,750
TOTAL EMISSIONS	69,050	46,700	414,350	60,950	65,250

STUDY AREA

The Study Area for the emission inventory of the Atlanta Metropolitan Area consists of seven counties--Clayton, Cobb, DeKalb, Douglas, Fulton, Gwinnett and Henry. All counties, with the exceptions of Douglas and Henry, are in the designated Standard Metropolitan Statistical Area around Atlanta. Douglas and Henry County were included to insure that all counties that may have a high rate of growth in future years are in the Study Area. Figure 1 shows the location of the Atlanta Study Area relative to other cities in its vicinity. Figure 2 represents a more detailed drawing of the Study Area.

The heaviest industrialized areas in the Study Area are located in Fulton County. The industry is mainly oriented toward agricultural and textile products (see Table 3) and unlike the northeastern sections of the nation has very little heavy industry.

Although the total area is slightly over 2100 square miles, only some 110 square miles are at present urbanized. About 45 percent of the Study Area's 1,300,000 people reside in Fulton County. The 1960 and estimated 1968 population of each county are presented in Table 2. Comparison of the 1960 and 1968 populations for the countryshows an increase of 10.9 percent, where as the Atlanta Study Area increased by approximately 22.7 percent in the same period. A population density map of the Study Area is shown as Figure 3.

TABLE 2 POPULATION FIGURES FOR THE ATLANTA STUDY AREA

	1960	1968	Percent Increase
Fulton County	556,326	605,700	8.8
DeKalb County	256,782	336,800	31.1
Cobb County	114,174	167,600	46.7
Henry County	17,619	24,500	39.0
Gwinnett County	43,541	56,500	29.7
Clayton County	46,365	75,300	62.4
Douglas County	16,741	24,900	48.7
TOTAL	1,051,548	1,291,300	22.7

TABLE 3 NUMBER OF INDUSTRIAL ESTABLISHMENTS IN ATLANTA STUDY AREA BY COUNTY, 1960

	Fulton County	DeKalb County	Cobb County	Henry County	Gwinnett County	Clayton County	Douglas County
Food and Tobacco	71	1	3	--	3	2	--
Textiles	63	2	7	3	10	2	3
Paper & Printing	78	--	5	--	2	2	--
Chemicals	40	--	7	--	--	--	2
Lumber & Wood	26	1	7	2	--	2	--
Stone & Gravel	22	--	2	1	2	2	--
Primary & Intermediate Metals	32	--	2	--	3	5	--
Electrical Machinery	37	--	3	2	--	1	--
Transporation & Ordinance	18	--	1	--	--	--	--
Instruments & Miscellaneous	17	--	1	--	--	1	--

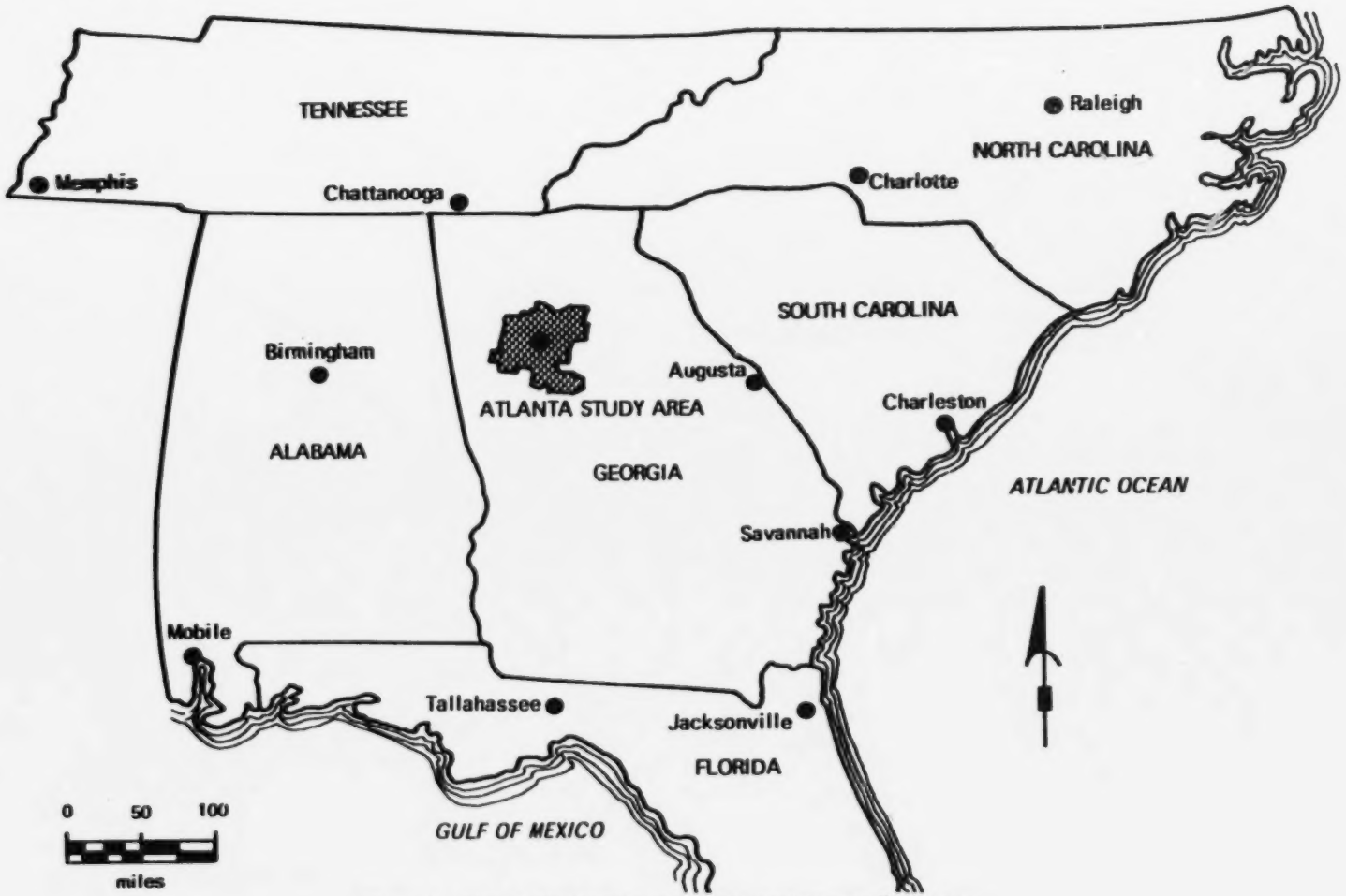


Figure 1. Map of the Atlanta study area and surrounding states.

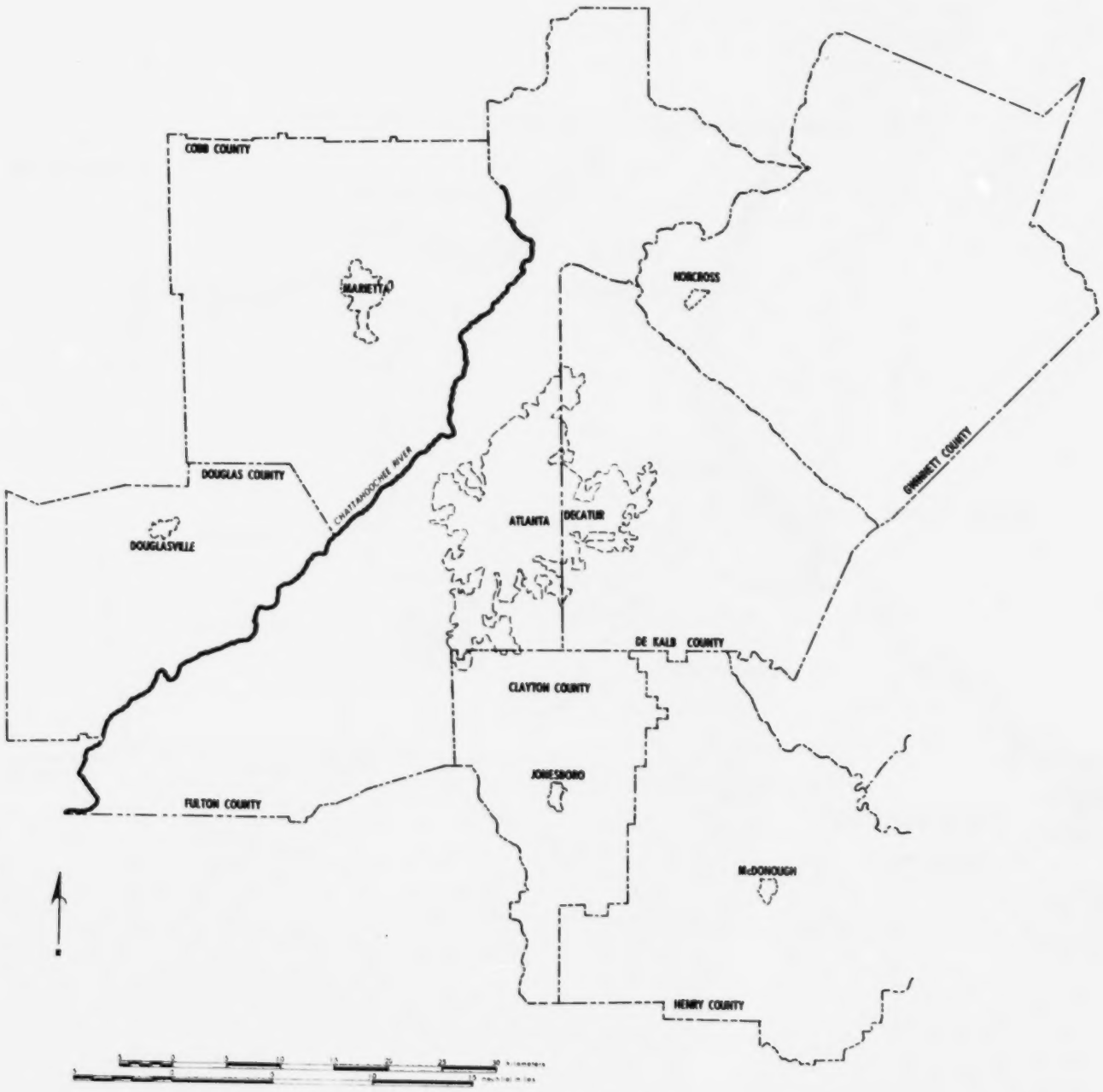
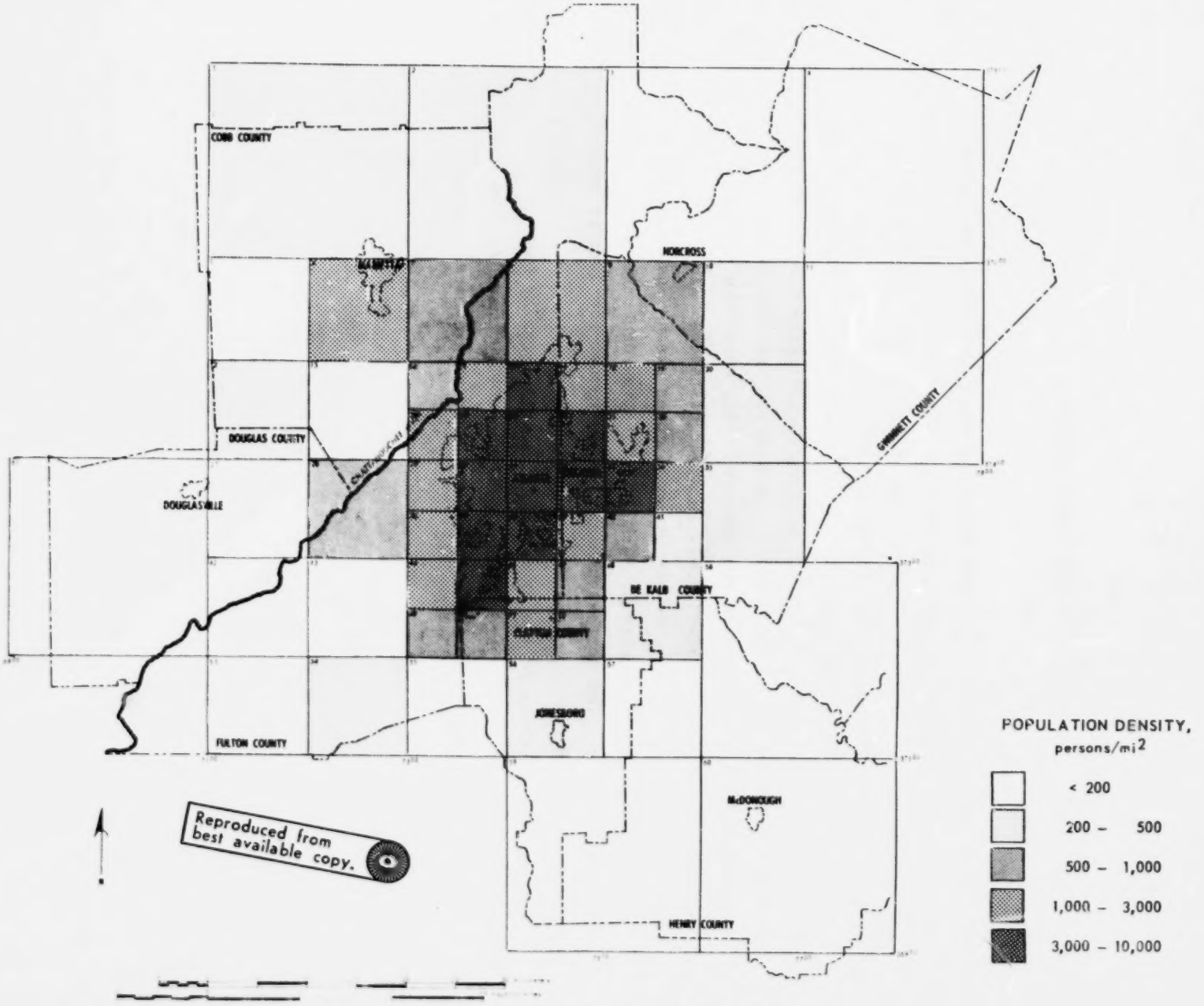


Figure 2. Map of the study area used for the Atlanta air pollutant inventory.



Reproduced from best available copy.

Figure 3. Population density map of Atlanta study area.

GRID COORDINATE SYSTEM

Grid coordinates based on the Universal Transverse Mercator System were used in this study to show the geographical distribution of sources and emissions. As shown in Figure 4, the Study Area was divided into 61 grids of three different sizes--25,100 and 400 square kilometers.

Different size grids are used to limit the number of grid zones and yet allow a satisfactory definition of geographical gradation of emissions in areas where the majority of pollution occurs. For this reason, the 25 kilometer grids are used in the downtown areas where the emission densities should change abruptly within short distances. In areas primarily rural in nature, the use of small zones are not as important.

As illustrated in Figure 4, each grid line is identified by a coordinate number. The north-south and the east-west coordinates are expressed in hundreds of meters.

The point sources in the Study Area are identified by both horizontal and vertical coordinates to the nearest 100 meters. The grids are identified by the coordinates of their geographical center.

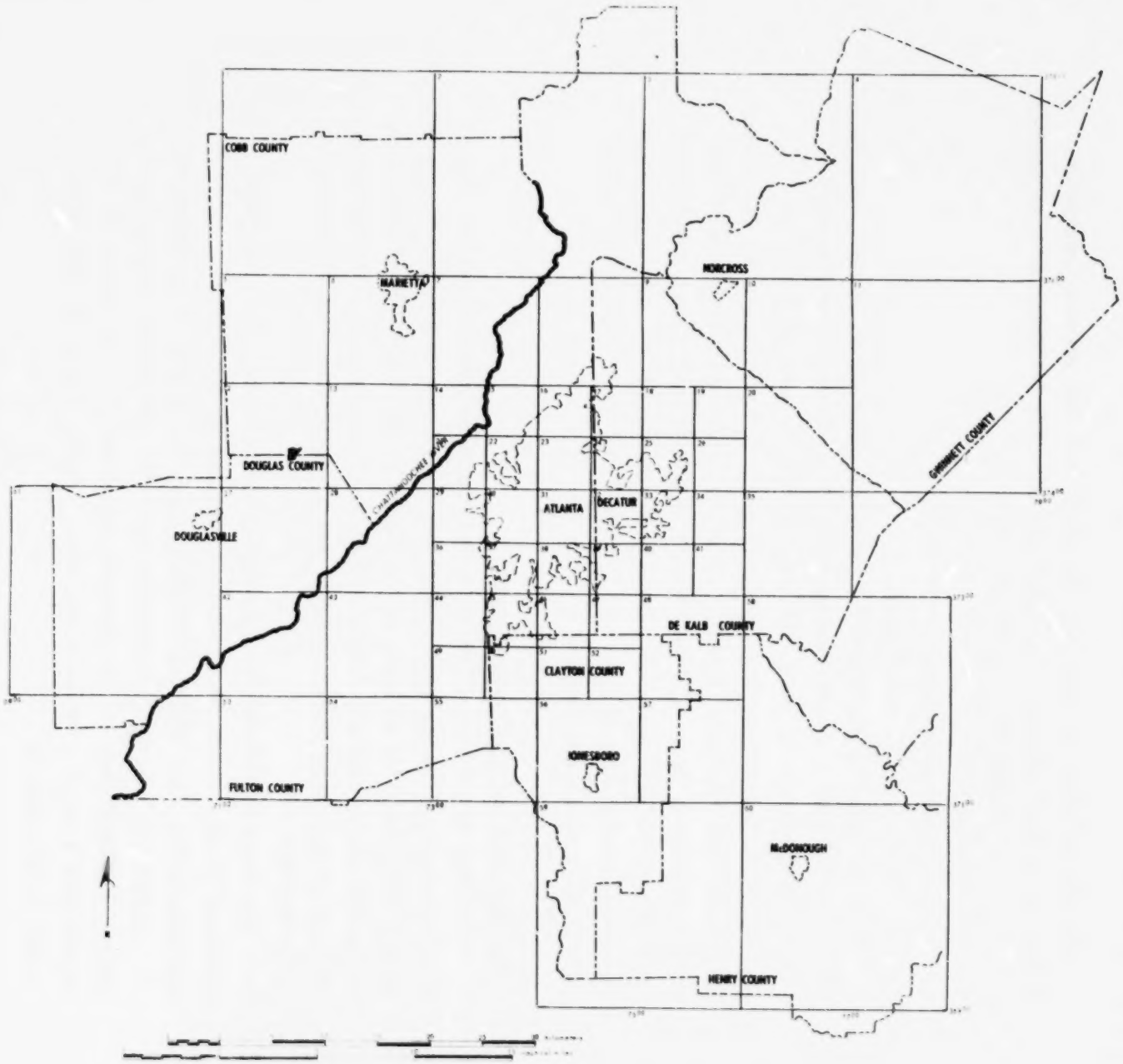


Figure 4. Grid coordinate system for the Atlanta study area.

EMISSIONS BY CATEGORY

For the purposes of compiling the basic data and emission estimates, the air pollutant sources were classified into the following four categories:

1. Fuel combustion in stationary sources
2. Transportation
3. Solid-waste disposal
4. Industrial process losses

Each of these categories are considered individually in this section where data sources are given and methods of calculation are discussed.

It is important to note that the estimates presented herein and especially in the process loss category are, in most cases, partial totals. This stems from the inavailability of emission factors as well as appropriate production data. In the case of hydrocarbon emissions where gasoline evaporation was included but solvent evaporation was not, the totals are considerably lower than actual values. The results should be viewed with these limitations in mind.

Fuel Combustion in Stationary Sources

Although all of the three major fuels are consumed within the Study Area, natural gas is the most significant. As shown in Tables 4-6, approximately 2 million tons of coal, 560 thousand barrels of oil, and 76 billion cubic feet of natural gas were consumed in the Study Area. The breakdown of fuel consumption by user category and by jurisdiction is also shown in these tables.

The three steam-electric generating plants within the Study Area consumed 97 percent of the total coal utilized by all sources. Industry and residential need very little coal since natural gas is so abundant.

Distillate fuel oil is consumed mainly in residential heating purposes. Residual fuel oil is consumed almost entirely in industrial operations with a small portion of the total used by commercial and institutional establishments.

TABLE 4 SUMMARY OF COAL CONSUMPTION IN ATLANTA STUDY AREA, 1968 (TONS/YEAR)

	Residential	Commercial	Industrial	Steam-Electric
Fulton County	12,300	8,000	20,000	40,000
DeKalb County	3,700	--	--	--
Cobb County	5,100	--	--	1,900,000
Henry County	1,900	--	--	--
Gwinnett County	3,800	--	--	--
Clayton County	2,200	2,500	--	--
Douglas County	1,500	--	--	--
TOTAL	30,500	10,500	20,000	1,940,000

TABLE 5 SUMMARY OF FUEL OIL CONSUMPTION IN ATLANTA STUDY AREA, 1968 (BBL/YEAR)

	Residential	Commercial	Industrial	Steam-Electric
Fulton County	89,000	90,000	130,000	--
DeKalb County	45,000	20,000	--	--
Cobb County	37,000	10,000	17,000	7,000
Henry County	8,000	1,000	--	--
Gwinnett County	2,800	3,000	8,000	--
Clayton County	16,000	5,000	7,000	--
Douglas County	4,000	1,000	--	--
TOTAL	201,800	130,000	162,000	7,000

TABLE 6 SUMMARY OF NATURAL GAS CONSUMPTION IN ATLANTA STUDY AREA, 1968 (10^6 cu. ft./Year)

	Residential	Commercial	Industrial	Steam-Electric
Fulton County	14,000	13,000	19,000	--
DeKalb County	6,400	2,000	1,000	--
Cobb County	2,300	1,000	1,800	12,800
Henry County	300	100	400	--
Gwinnett County	500	300	500	--
Clayton County	900	500	600	--
Douglas County	200	100	200	--
TOTAL	24,600	17,000	23,500	12,800

Industrial sources consume 30 percent of the natural gas in the Study Area; residential heating 31 percent and commercial and institutional 22 percent. The natural gas consumed by steam-electric plants accounts for only about 17 percent.

Average values for the sulfur and ash contents of the fuel used are summarized in Table 7.[4,5]

Emissions from Fuel Combustion

Air pollutant emissions resulting from fuel combustion in stationary sources are listed in Table 8. The emissions are presented for industrial, steam-electric utility, residential, and commercial and institutional sources.

The emissions from fuel burning are mainly accounted for by coal combustion. Coal contribution ranges from 99 percent of the sulfur oxides to 70 percent of the oxides of nitrogen caused by fuel combustion. The major users of coal in the region are the steam and electric utilities.

The emissions caused by other user categories are minimal since most consume large quantities of natural gas instead of coal and high sulfur residual fuel oil.

Data Sources

Fuel consumption data for the Study Area were obtained from diverse sources. Natural gas numbers were obtained from the Atlanta Gas Light Company. They were provided on an area wide basis with a breakdown by industry, residential, commercial and institutional source category.

Coal consumption data in the five county area was obtained mainly from the individual point sources. Residential coal by county was estimated from the number of dwelling units using coal and the total number of degree days for the area. This method is described in detail in the Rapid Survey Technique.[6]

Oil consumption was gotten in much the same manner as coal. An emission survey already completed by the Fulton County Health Department was also used.

TABLE 7 CHEMICAL ANALYSIS OF FUELS BURNED IN ATLANTA STUDY AREA

	Percent Sulfur	Percent Ash	Percent Volatile
Coal	1.7	7.3	35.7
Residual Fuel Oil	1.65	--	--
Distillate Fuel Oil	.21	--	--
Natural Gas	.0008	--	--

TABLE 8 SUMMARY OF EMISSIONS FROM BURNING OF FUELS IN STATIONARY SOURCES, 1968 (TONS/YEAR)

	User Category	Sulfur Oxides	Partic-ulates	Carbon Monoxide	Hydro-carbons	Nitrogen Oxides
Coal	Industrial	1,490	510	30	10	190
	Steam-Electric	62,740	21,870	480	190	19,420
	Residential	980	220	760	150	120
	Commercial	340	130	260	50	40
	Totals	65,550	22,730	1,530	400	19,770
Fuel Oil	Industrial	370	80	10	10	350
	Steam-Electric	10	--	--	--	20
	Residential	160	40	10	10	60
	Commercial	100	40	10	10	200
	Totals	640	160	30	30	630
Gas	Industrial	10	300	10	--	2,500
	Steam-Electric	--	90	--	--	2,340
	Residential	10	230	10	N	1,430
	Commercial	--	160	--	--	990
	Totals	20	780	20	--	7,260
GRAND TOTALS		66,210	23,670	1,580	430	27,660

Transportation

Two types of transportation sources of air pollution are considered in this survey--road vehicles, and aircraft. Road vehicles, which are by far the most significant source of air pollution in this category, are further subdivided according to type of fuel--gasoline and diesel.

Road Vehicles

The miles of travel by motor vehicles in the Study Area are summarized in Table 9. Very little vehicle-mile data was available in the Atlanta area with exception of vehicle counts done by the State Highway Department of Georgia on state roads. The state motor vehicle data and the 1968 population were used to distribute the automobile activity after the vehicle-mile data were obtained from gasoline consumption.

Travel by diesel powered vehicles was estimated from state-wide diesel fuel consumption figures. It was found that approximately 3.3 percent of the vehicle miles in the Area is diesel. Vehicle miles by diesel were also proportioned in a similar manner.

Aircraft

Table 11 shows the air traffic activity at the Atlanta Metropolitan airport. The total aircraft operations were supplied by the Fulton County Health Department's emission survey. An operation is defined as either a take-off or a landing. Aircraft account for about 50 percent of the total particulate emissions contributed to transportation. Aircraft contribute much less to the total transportation emissions in the other pollutant categories.

Solid Waste Disposal

Approximately 1,800,000 tons of refuse were generated during 1968 in the Study Area. Table 13 presents a solid waste balance for the Atlanta Study Area, showing the various methods of disposal and the quantities disposed of by each method.

Refuse data for all counties was supplied by the Department of Health which had a complete list of all dumps and estimates of the amount being deposited in each.

Table 14 shows the air pollutant emissions from solid waste disposal in the Atlanta Study Area. A total of 20,500 tons of carbon monoxide, 11,000 tons of particulates, and 3,500 tons of nitrogen oxides were emitted from solid waste disposal practices.

Industrial Process Losses

Table 15 shows the emission losses due to industrial process. All of these emissions were gathered from data on individual sources, and most are point sources within this survey.

TABLE 9 VEHICLES-MILES TRAVEL IN ATLANTA STUDY AREA, 1968 (10^3 Vehicle-Miles/Day)

Political Jurisdiction	Gasoline Powered	Diesel Powered
Fulton County	6,513	222
DeKalb County	2,556	87
Cobb County	1,500	51
Henry County	158	5
Gwinnett County	334	11
Clayton County	655	22
Douglas County	160	5
TOTAL	11,876	403

TABLE 10 GASOLINE AND DIESEL CONSUMPTION IN ATLANTA STUDY AREA, 1968 (10^6 gal./year)

Jurisdiction	Gasoline Consumption	Diesel Consumption
Fulton County	190	16
DeKalb County	75	6
Cobb County	44	4
Henry County	5	**
Gwinnett County	10	1
Clayton County	19	2
Douglas County	5	**
TOTAL	348	29

** Less than 1 million gallons per year

TABLE 11A AIR ACTIVITY AT ATLANTA MUNICIPAL AIRPORT, 1968

	Itinerant Operations	Local Operations
Air Carrier	312,912	--
General Aviation	69,221	16,031
Military	2,126	155
Total	384,259	16,186

TABLE 11B AIR ACTIVITY AT FULTON COUNTY AIRPORT, 1968

	Itinerant Operations	Local Operations
Air Carrier	254	--
General Aviation	91,015	146,750
Military	5,973	4,923
Total	97,242	151,673

TABLE 11C AIR ACTIVITY AT DEKALB AIRPORT, 1968

	Itinerant Operations	Local Operations
Air Carrier	--	--
General Aviation	99,798	79,340
Military	378	430
Total	100,176	79,770

TABLE 12 SUMMARY OF TRANSPORTATION EMISSIONS IN ATLANTA STUDY AREA, 1968 (TONS/YEAR)

	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Road Vehicles					
Gasoline	1,300	1,750	362,000	27,300	18,450
Diesel	650	1,600	850	1,950	3,200
Aircraft					
Jet	--	3,450	4,250	1,950	2,550
Piston	--	200	17,250	3,250	1,000
Totals	1,950	7,000	384,350	34,450	25,200

TABLE 13 REFUSE BALANCE FOR ATLANTA STUDY AREA, 1968 (TONS/YEAR)

Jurisdiction	Total Generation	INCINERATION				On-Site Burning
		Municipal	On-Site	Landfill	Dump	
Clayton Co.	80,000	--	10,000	--	20,000	50,000
Cobb Co.	170,000	--	40,000	--	40,000	90,000
DeKalb Co.	340,000	160,000	100,000	--	30,000	50,000
Douglas Co.	25,000	--	--	--	3,000	22,000
Fulton Co.	1,100,000	350,000	200,000	200,000	280,000	70,000
Gwinnett Co.	60,000	--	--	--	20,000	40,000
Henry Co.	25,000	--	--	--	--	25,000

TABLE 14 AIR POLLUTANT EMISSIONS FROM SOLID WASTE DISPOSAL IN ATLANTA STUDY AREA, 1968 (TONS/YEAR)

	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Total Incineration	850	7,300	400	100	900
Municipal	500	4,350	250	50	550
On-Site	350	2,950	150	50	350
Total Open Burning	--	3,750	20,050	1,200	2,600
Dumps	--	1,150	6,200	350	800
On-Site	--	2,600	13,850	850	1,800
TOTAL EMISSIONS	850	11,050	20,450	1,300	3,500

TABLE 15 AIR POLLUTANT EMISSIONS FROM PROCESS EMISSION SOURCES IN ATLANTA STUDY AREA, 1968 (TONS/YEAR)

	Sulfur Oxides	Partic-ulates	Carbon Monoxide	Hydro-carbon	Nitrogen Oxides
Agricultural Products	--	40	--	--	--
Cement Production	--	1,500	--	--	--
Metal Operations	--	70	--	--	--
Paint Manufacturing	--	--	--	4,610	--
Rock & Gravel Operations	--	1,520	--	--	--
Lumber Manufact-uring	30	1,760	7,900	1,980	8,730
Other	--	20	--	--	--
TOTAL	30	4,910	7,900	6,590	8,730

EMISSIONS BY JURISDICTION

In order to decide the relative significance between jurisdictions from an air pollution standpoint, emissions for each of the seven jurisdictions have been summarized. Table 16 through Table 22 present the summary of each of these jurisdictions.

TABLE 16 SUMMARY OF AIR POLLUTANT EMISSIONS FOR CLAYTON COUNTY, 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbon	Nitrogen Oxides
Transportation					
Road Vehicles	100	180	20,000	1,610	1,190
Evaporation	--	--	--	1,000	--
Other	--	--	--	--	--
Combustion of Fuels By Stationary Sources					
Industry	20	10	--	--	100
Steam-Electric	--	--	--	--	--
Residential	80	30	60	10	60
Commercial	90	40	60	10	50
Refuse Disposal					
Incineration	10	80	N	N	10
Open Burning	--	460	2,430	140	320
Industrial Process Emissions	--	750	--	--	--
TOTAL EMISSIONS	300	1,550	22,550	2,770	1,730

TABLE 17 SUMMARY OF AIR POLLUTANT EMISSIONS FOR COBB COUNTY, 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbon	Nitrogen Oxides
Transportation					
Road Vehicles	240	420	45,860	3,690	2,730
Evaporation	--	--	--	2,300	--
Other	--	--	--	--	--
Combustion of Fuels By Stationary Sources					
Industry	80	40	--	--	290
Steam-Electric	61,450	20,060	480	190	21,380
Residential	190	70	130	30	170
Commercial	10	10	--	--	70
Refuse Disposal					
Incineration	40	320	20	N	40
Open Burning	--	840	4,460	270	580
Industrial Process Emissions		--	--	--	--
TOTAL EMISSIONS	62,010	21,760	50,950	6,480	25,260

TABLE 18 SUMMARY OF AIR POLLUTANT EMISSIONS FOR DEKALB COUNTY, 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbon	Nitrogen Oxides
Transportation					
Road Vehicles	400	720	78,120	6,300	4,660
Evaporation	--	--	--	3,920	--
Other	--	70	5,370	1,030	270
Combustion of Fuels By Stationary Sources					
Industry	--	10	--	--	110
Steam-Electric	--	--	--	--	--
Residential	150	100	100	20	400
Commercial	10	30	--	--	150
Refuse Disposal					
Incineration	260	2,210	130	30	260
Open Burning	--	490	2,600	160	340
Industrial Process Emissions	--	160	--	4,610	--
TOTAL EMISSIONS	820	3,790	86,320	16,070	6,190

TABLE 19 SUMMARY OF AIR POLLUTANT EMISSIONS FOR DOUGLAS COUNTY, 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxide
Transportation					
Road Vehicles	20	40	4,900	390	290
Evaporation	--	--	--	250	--
Other	--	--	--	--	--
Combustion of Fuels By Stationary Sources					
Industry	--	--	--	--	20
Steam-Electric	--	--	--	--	--
Residential	50	10	40	10	20
Commercial	--	--	--	--	10
Refuse Disposal					
Incineration	--	--	--	--	--
Open Burning	--	190	990	60	130
Industrial Process Emissions	--	--	--	--	--
TOTAL EMISSIONS	70	240	5,930	710	470

TABLE 20 SUMMARY OF AIR POLLUTANT EMISSIONS FOR FULTON COUNTY, 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Road Vehicles	1,030	1,830	199,030	16,040	11,870
Evaporation				9,980	
Other		3,570	16,000	4,140	3,280
Combustion of Fuels By Stationary Sources					
Industry	1,760	760	40	10	2,510
Steam-Electric	1,290	1,900	10	--	400
Residential	460	240	310	70	880
Commercial	320	250	210	40	920
Refuse Disposal					
Incineration	550	4,680	280	80	550
Open Burning	--	1,390	7,400	440	970
Industrial Process Emissions	30	3,890	7,900	1,980	8,730
TOTAL EMISSIONS	5,440	18,510	231,180	32,780	30,110

TABLE 21 SUMMARY OF AIR POLLUTANT EMISSIONS FOR GWINNETT COUNTY, 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbon	Nitrogen Oxides
Transportation					
Road Vehicles	50	90	10,200	820	610
Evaporation	--	--	--	510	--
Other	--	--	--	--	--
Combustion of Fuels By Stationary Sources					
Industry	20	--	--	--	10
Steam-Electric	--	--	--	--	--
Residential	140	40	100	20	50
Commercial	--	--	--	--	20
Refuse Disposal					
Incineration	--	--	--	--	--
Open Burning	--	380	2,010	120	260
Industrial Process Emissions	--	--	--	--	--
TOTAL EMISSIONS	210	510	12, 310	1,470	950

TABLE 22 SUMMARY OF AIR POLLUTANT EMISSIONS FOR HENRY COUNTY, 1968 (TONS/YEAR)

Source Category	Sulfur Oxides	Particulates	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides
Transportation					
Road Vehicles	20	40	4,850	390	290
Evaporation	--	--	--	240	--
Other	--	--	--	--	--
Combustion of Fuels By Stationary Sources					
Industry	--	--	--	--	40
Steam-Electric	--	--	--	--	--
Residential	70	20	50	10	30
Commercial	--	--	--	--	10
Refuse Disposal					
Incineration	--	--	--	--	--
Open Burning	--	20	110	10	10
Industrial Process Emissions	--	--	--	--	--
TOTAL EMISSIONS	90	80	5,010	650	380

EMISSIONS BY GRID

For the purpose of modeling the air pollutant emissions in the Study Area, the resulting emissions were apportioned on the grid reference system shown in Figure 3.

The emissions of each pollutant were divided into two source subgroups--point and area sources. The point sources were identified by source category, grid numbers and horizontal and vertical coordinates. Figure 4 shows the approximate location of major point sources in the Study Area. The point sources are presented in Table 23, along with the emissions for the five pollutants for an average annual, winter and summer day.

The emissions for all sources on the annual, winter and summer basis are shown in Table 24. These emissions are the total of all area and point sources for each grid.

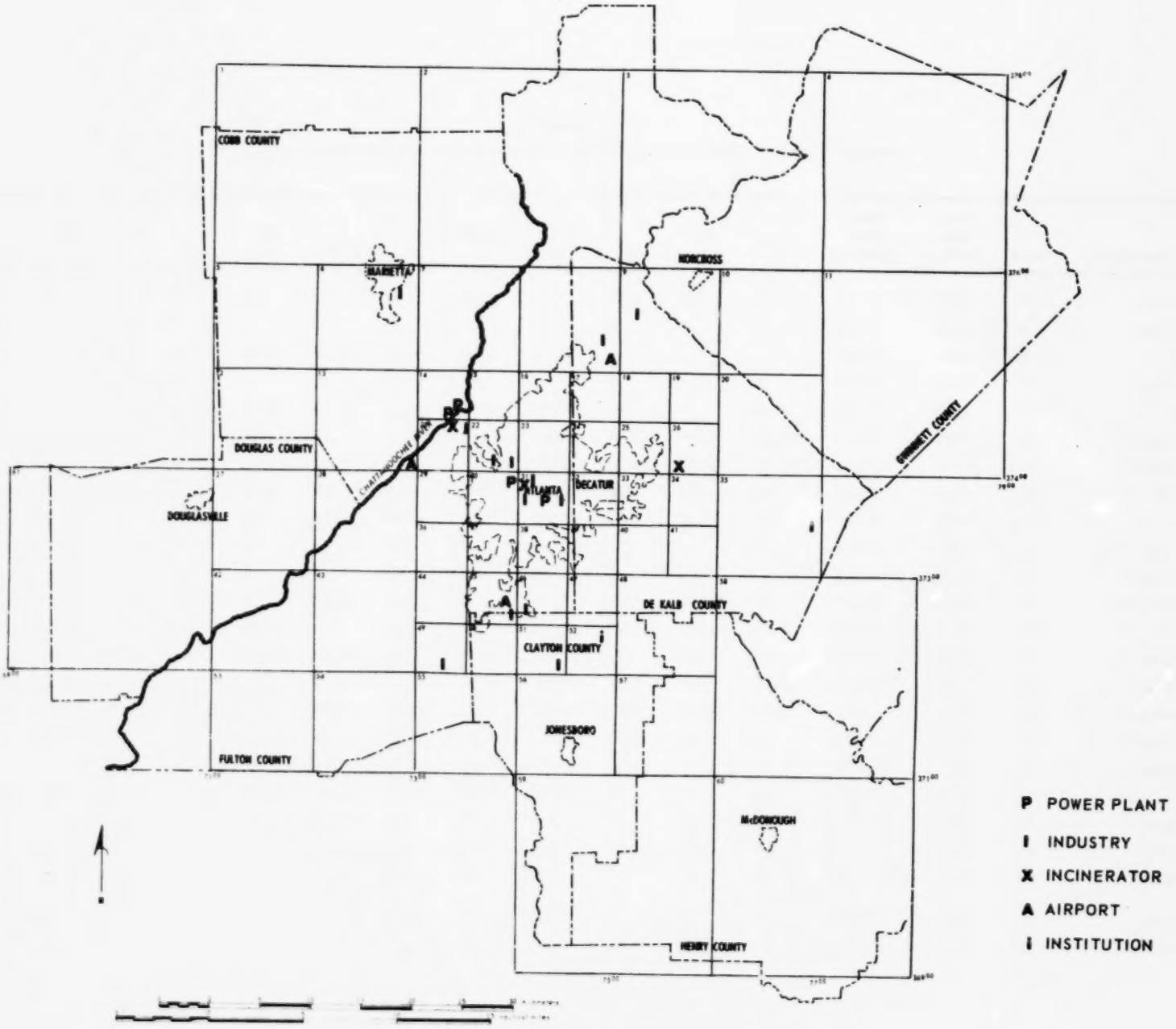


Figure 5. Point source location map of the Atlanta study area.

TABLE 23

SUMMARY OF POINT SOURCE EMISSIONS BY SEASON FOR THE ATLANTA STUDY AREA, 1967 (TONS/DAY)

Source Category	Grid	Hor. Coor. (100 m)	Vert. Coor. (100 m)	SOx S	SOx W	SOx A	PART. S	PART. W	PART. A	CO S	CO W	CO A	HC S	HC W	HC A	NOx S	NOx W	NOx A
Industrial	6	7280	37570	.01	.21	.09	--	.09	.04	--	.01	.01	--	.01	.01	.02	.45	.19
Industrial	8	7490	37523	--	--	--	--	--	--	--	--	--	12.62	12.62	12.62	--	--	--
Airport	8	7495	37510	--	--	--	0.18	0.18	0.18	14.73	14.73	14.73	2.84	2.84	2.84	0.75	0.75	0.75
Industrial	9	7518	37550	--	--	--	--	.05	.02	--	--	--	--	--	--	.02	.56	.24
Airport	13	7295	37405	--	--	--	0.16	0.16	0.16	19.20	19.20	19.20	3.66	3.66	3.66	0.93	0.93	0.93
Power Plant	14	7335	37455	33.86	33.86	33.40	18.49	18,49	18.24	.26	.26	.26	.11	.11	.10	13.76	13.76	13.57
Power Plant	14	7334	37453	136.84	136.84	134.96	37.24	37.24	36.72	1.06	1.06	1.04	0.42	0.42	0.42	45.63	45.63	45.00
Incineration	21	7334	37448	.38	.38	.38	3.21	3.21	3.21	0.19	0.19	0.19	0.06	0.06	0.06	0.38	0.38	0.38
Industrial	21	7338	37445	.49	.49	.49	4.70	4.70	4.70	.02	.02	.02	.01	.01	.01	.52	.52	52
Industrial	22	7398	37418	--	--	--	.13	.13	.13	--	--	--	--	--	--	.54	.54	.54
Industrial	22	7375	37413	--	--	--	.82	.82	.82	--	--	--	--	--	--	--	--	--
Incineration	26	7560	37403	.43	.43	.43	3.73	3.73	3.73	0.22	0.22	0.22	0.07	0.07	0.07	0.43	0.43	0.43
Power Plant	30	7397	37388	--	5.02	1.77	--	7.38	2.60	--	.04	.01	--	.02	.01	--	1.56	.55
Industrial	31	7405	37385	.07	.07	.07	4.79	4.79	4.79	21.50	21.50	21.50	5.27	5.27	5.27	23.90	23.90	23.90
Industrial	31	7440	37375	2.64	3.78	3.11	0.20	0.29	0.24	0.03	0.04	0.03	0.01	0.01	0.01	0.42	0.60	0.49
Incineration	31	7401	37387	0.57	0.57	0.57	4.82	4.82	4.82	0.28	0.28	0.28	0.09	0.09	0.09	0.57	0.57	0.57
Power Plant	31	7423	37377	--	5.02	1.77	--	7.38	2.60	--	.04	.01	--	.02	.01	--	1.56	.55
Industrial	35	7960	37350	--	--	--	.41	.41	.41	--	--	--	--	--	--	--	--	--
Airport	45	7390	37265	--	--	--	9.62	9.62	9.62	24.63	24.63	24.63	7.64	7.64	7.64	8.06	8.06	8.06
Industrial	45	7395	37280	.05	.06	.05	.05	.06	.05	--	--	--	--	--	--	.45	.51	.47
Industrial	46	7410	37265	.01	.03	.02	.01	.04	.02	--	--	--	--	--	--	.12	.32	.20
Industrial	49	7325	37210	--	--	--	.88	.88	.88	--	--	--	--	--	--	--	--	--
Industrial	51	7445	37210	--	--	--	2.06	2.06	2.06	--	--	--	--	--	--	--	--	--
Institutional	52	7483	37238	--	.59	.24	--	.22	.09	--	.42	.17	--	.08	.03	--	.20	.08

TABLE 24

EMISSIONS FROM TOTAL SOURCES IN ATLANTA STUDY AREA BY GRID (TONS/DAY)

Grid	Hor. Coor. (100 m)	Hor. Coor. (100 m)	Area (mi^2)	SOx SUM	SOx WIN	SOx AVG	PART. SUM	PART. WIN	PART. AVG	CO SUM	CO WIN	CO AVG	HC SUM	HC WIN	HC AVG	NOx SUM	NOx WIN	NOx AVG
1	7200	37700	154.40	0.24	0.82	0.48	1.12	1.29	1.19	37.28	34.38	36.12	4.67	4.32	4.53	2.61	2.93	2.74
2	7400	37700	154.40	0.21	0.22	0.22	0.88	0.90	0.89	36.88	33.49	35.53	4.70	4.26	4.52	2.36	2.45	2.40
3	7600	37700	154.40	0.06	0.25	0.14	0.59	0.64	0.61	12.77	11.88	12.41	1.50	1.40	1.46	0.94	0.98	0.96
4	7800	37700	154.40	0.08	0.45	0.23	0.30	0.41	0.34	12.26	11.42	11.93	1.53	1.45	1.50	0.90	1.11	0.99
5	7150	37550	38.60	0.02	0.02	0.02	0.16	0.16	0.16	4.58	4.19	4.43	0.56	0.51	0.54	0.31	0.31	0.31
6	7250	37550	38.60	0.28	1.15	0.64	1.23	1.54	1.36	40.54	37.41	39.30	5.08	4.72	4.94	2.93	3.97	3.35
7	7350	37550	38.60	0.18	0.19	0.18	1.02	1.04	1.03	31.85	29.06	30.73	16.58	16.22	16.44	2.13	2.18	2.15
8	7450	37550	38.60	0.30	0.31	0.30	1.83	1.86	1.86	58.19	54.29	56.63	8.32	7.81	8.12	3.77	3.92	3.83
9	7550	37550	38.60	0.15	0.23	0.18	0.67	0.77	0.71	25.55	23.36	24.67	3.18	2.89	3.06	1.87	2.70	2.22
10	7650	37550	38.60	0.02	0.15	0.07	0.14	0.17	0.15	5.61	5.21	5.45	0.69	0.64	0.67	0.37	0.39	0.38
11	7800	37500	154.40	0.03	0.20	0.10	0.18	0.22	0.19	7.10	6.60	6.90	0.88	0.82	0.86	0.46	0.49	0.47
12	7150	37450	38.60	0.05	0.05	0.05	0.30	0.30	0.30	8.69	7.93	8.38	1.08	0.98	1.04	0.59	0.59	0.59
13	7250	37450	38.60	0.04	0.05	0.04	0.44	0.44	0.44	27.17	26.49	26.54	4.65	4.56	4.61	1.47	1.49	1.48
14	7325	37475	9.65	170.77	170.79	168.43	55.99	56.01	55.22	8.31	7.71	8.05	1.39	1.31	1.35	59.96	60.04	59.17
15	7375	37475	9.65	0.06	0.06	0.06	0.38	0.39	0.38	11.49	10.50	11.09	1.41	1.28	1.36	0.78	0.81	0.80
16	7425	37475	9.65	0.18	0.21	0.20	0.60	0.67	0.63	30.93	28.00	29.76	4.01	3.63	3.86	1.91	2.30	2.07
17	7475	37475	9.65	0.10	0.11	0.11	0.42	0.44	0.43	17.33	15.72	16.68	2.23	2.02	2.14	1.11	1.18	1.14
18	7525	37475	9.65	0.08	0.09	0.09	0.34	0.35	0.34	13.82	12.54	13.31	1.77	1.60	1.70	0.88	0.94	0.90
19	7575	37475	9.65	0.03	0.05	0.04	0.14	0.17	0.15	5.08	4.61	4.89	0.65	0.59	0.62	0.33	0.55	0.41
20	7650	37450	38.60	0.05	0.09	0.07	0.21	0.22	0.21	9.00	8.17	8.67	1.15	1.05	1.11	0.56	0.60	0.58
21	7325	37425	9.65	1.22	1.35	1.27	8.72	8.88	8.79	21.58	19.67	20.82	2.76	2.51	2.66	3.31	4.18	3.67

EMISSIONS FROM TOTAL SOURCES (cont.)

Grid	Hor. Coor. (100 m)	Vert. Coor. (100 m)	Area (mi^2)	SOx SUM	SOx WIN	SOx AVG	PART. SUM	PART. WIN	PART. AVG	CO SUM	CO WIN	CO AVG	HC SUM	HC WIN	HC AVG	NOx SUM	NOx WIN	NOx AVG
22	7375	37425	9.65	0.33	0.48	0.39	1.88	2.09	1.97	29.37	26.70	28.30	3.74	3.39	3.60	3.41	4.57	3.89
23	7425	37425	9.65	0.38	1.07	0.67	1.06	1.45	1.22	49.57	45.29	47.86	6.45	5.92	6.24	3.57	5.07	4.19
24	7475	37425	9.65	0.16	0.35	0.24	0.59	0.68	0.63	25.03	22.82	24.15	3.24	2.96	3.12	1.60	1.91	1.72
25	7525	37425	9.65	0.12	0.28	0.18	0.43	0.50	0.46	17.78	16.26	17.23	2.30	2.11	2.22	1.14	1.43	1.26
26	7575	37425	9.65	0.47	0.47	0.47	3.89	3.90	3.90	6.80	6.20	6.56	0.91	0.83	0.88	0.86	0.88	0.87
27	7150	37350	38.60	0.00	0.01	0.00	0.33	0.33	0.33	3.34	3.18	3.28	0.32	0.30	0.31	0.31	0.31	0.31
28	7250	37350	38.60	0.15	0.17	0.16	0.69	0.71	0.70	28.02	25.47	27.00	3.55	3.22	3.42	1.81	1.86	1.84
29	7325	37375	9.65	0.11	0.11	0.11	0.54	0.55	0.55	19.15	17.44	18.46	2.40	2.18	2.31	1.27	1.32	1.29
30	7375	37375	9.65	0.45	6.32	2.58	1.28	8.98	4.01	73.38	66.99	70.82	9.60	8.82	9.29	4.48	6.91	5.39
31	7425	37375	9.65	4.03	13.20	7.51	11.77	20.84	15.06	106.79	100.87	104.43	16.41	15.80	16.17	31.69	37.66	34.05
32	7475	37375	9.65	0.22	0.45	0.31	0.81	0.91	0.85	33.65	30.66	32.45	4.35	3.98	4.20	2.14	2.49	2.28
33	7525	37375	9.65	0.14	0.34	0.22	0.51	0.59	0.54	21.18	19.40	20.44	2.74	2.51	2.65	1.36	1.66	1.48
34	7575	37375	9.65	0.08	0.09	0.08	0.34	0.35	0.34	13.45	12.20	19.95	1.72	1.56	1.66	0.86	0.91	0.88
35	7650	37350	38.60	0.04	0.05	0.04	0.58	0.59	0.59	7.49	6.79	7.21	0.96	0.87	0.92	0.47	0.50	0.48
36	7325	37325	9.65	0.07	0.08	0.07	0.25	0.26	0.26	13.05	11.81	12.56	1.69	1.53	1.62	0.81	0.85	0.83
37	7375	37325	9.65	0.23	0.32	0.26	0.69	0.85	0.75	31.84	28.83	30.64	4.27	3.88	4.12	2.25	3.15	2.62
38	7425	37325	9.65	0.31	0.83	0.53	0.94	1.26	1.06	34.57	31.59	33.38	4.49	4.12	4.34	2.94	4.39	3.53
39	7475	37325	9.65	0.08	0.18	0.12	0.31	0.34	0.32	13.23	12.06	12.76	1.70	1.55	1.64	0.83	0.89	0.86
40	7525	37325	9.65	0.02	0.02	0.02	0.08	0.08	0.08	3.97	3.60	3.83	0.51	0.47	0.49	0.25	0.27	0.26
41	7575	37325	9.65	0.01	0.01	0.01	0.06	0.07	0.06	2.22	2.03	2.14	0.39	0.25	0.26	0.15	0.16	0.15
42	7150	37250	38.60	0.01	0.01	0.01	0.02	0.02	0.02	2.80	2.53	2.69	0.36	0.33	0.35	0.16	0.17	0.17

EMISSIONS FROM TOTAL SOURCES (cont.)

Grid	Hor. Coor. (100 m)	Vert. Coor. (100 m)	Area (mi^2)	SOx SUM	SOx WIN	SOx AVG	PART. SUM	PART. WIN	PART. AVG	CO SUM	CO WIN	CO AVG	HC SUM	HC WIN	HC AVG	NOx SUM	NOx WIN	NOx AVG
43	7250	37250	38.60	0.04	0.04	0.04	0.32	0.33	0.33	7.63	7.01	7.38	0.91	0.83	0.88	0.55	0.57	0.56
44	7325	37275	9.65	0.06	0.06	0.06	0.21	0.21	0.21	10.98	9.94	10.57	1.42	1.29	1.37	0.68	0.71	0.69
45	7375	37275	9.65	0.24	0.28	0.25	10.27	10.35	10.30	56.18	53.19	54.98	11.73	11.35	11.58	10.72	10.90	10.64
46	7425	37275	9.65	0.12	0.15	0.14	0.31	0.36	0.33	16.20	14.66	15.58	2.10	1.91	2.02	1.14	1.40	1.24
47	7475	37275	9.65	0.02	0.02	0.02	0.07	0.07	0.07	4.59	4.16	4.42	0.59	0.53	0.57	0.28	0.29	0.29
48	7550	37250	38.60	0.03	0.04	0.04	0.08	0.09	0.09	7.51	6.80	7.23	0.97	0.88	0.93	0.46	0.48	0.47
49	7325	37225	9.65	0.04	0.04	0.04	1.01	1:01	1.01	7.00	6.34	6.74	0.91	0.82	0.88	0.43	0.45	0.44
50	7375	37225	9.65	0.04	0.04	0.04	0.28	0.29	0.28	7.27	6.66	7.02	0.88	0.80	0.84	0.51	0.51	0.51
51	7425	37225	9.65	0.09	0.34	0.19	2.64	2.71	2.67	14.45	13.43	14.05	1.74	1.62	1.70	1.14	1.33	1.22
52	7475	37225	9.65	0.02	0.61	0.26	0.18	0.41	0.28	4.99	4.99	4.99	0.60	0.63	0.61	0.34	0.56	0.43
53	7150	37150	38.60	0.02	0.03	0.02	0.25	0.25	0.25	6.62	6.09	6.41	0.78	0.71	0.75	0.48	0.49	0.48
54	7250	37150	38.60	0.03	0.03	0.03	0.26	0.27	0.26	8.35	7.65	8.07	1.00	0.91	0.97	0.58	0.60	0.59
55	7350	37150	38.60	0.02	0.02	0.02	0.08	0.08	0.08	4.96	4.50	4.78	0.63	0.57	0.60	0.31	0.32	0.31
56	7450	37150	38.60	0.07	0.32	0.18	0.63	0.68	0.65	15.30	14.23	14.87	1.83	1.70	1.78	1.09	1.11	1.10
57	7550	37150	38.60	0.02	0.02	0.02	0.08	0.08	0.08	4.83	4.39	4.65	0.61	0.55	0.59	0.30	0.31	0.30
58	7700	37200	154.40	0.01	0.01	0.01	0.01	0.02	0.02	2.07	1.87	1.99	0.27	0.24	0.26	0.12	0.13	0.12
59	7500	37000	154.40	0.06	0.31	0.16	0:19	0.25	0.21	12.66	11.66	12.26	1.63	1.51	1.58	0.78	0.83	0.80
60	7700	37000	154.40	0.02	0.18	0.09	0.05	0.09	0.07	4.23	3.95	4.12	0.55	0.52	0.54	0.25	0.28	0.27
61	7000	37300	154.40	0.05	0.37	0.18	0.76	0.84	0.79	13.96	13.20	13.66	1.59	1.50	1.55	1.06	1.10	1.08

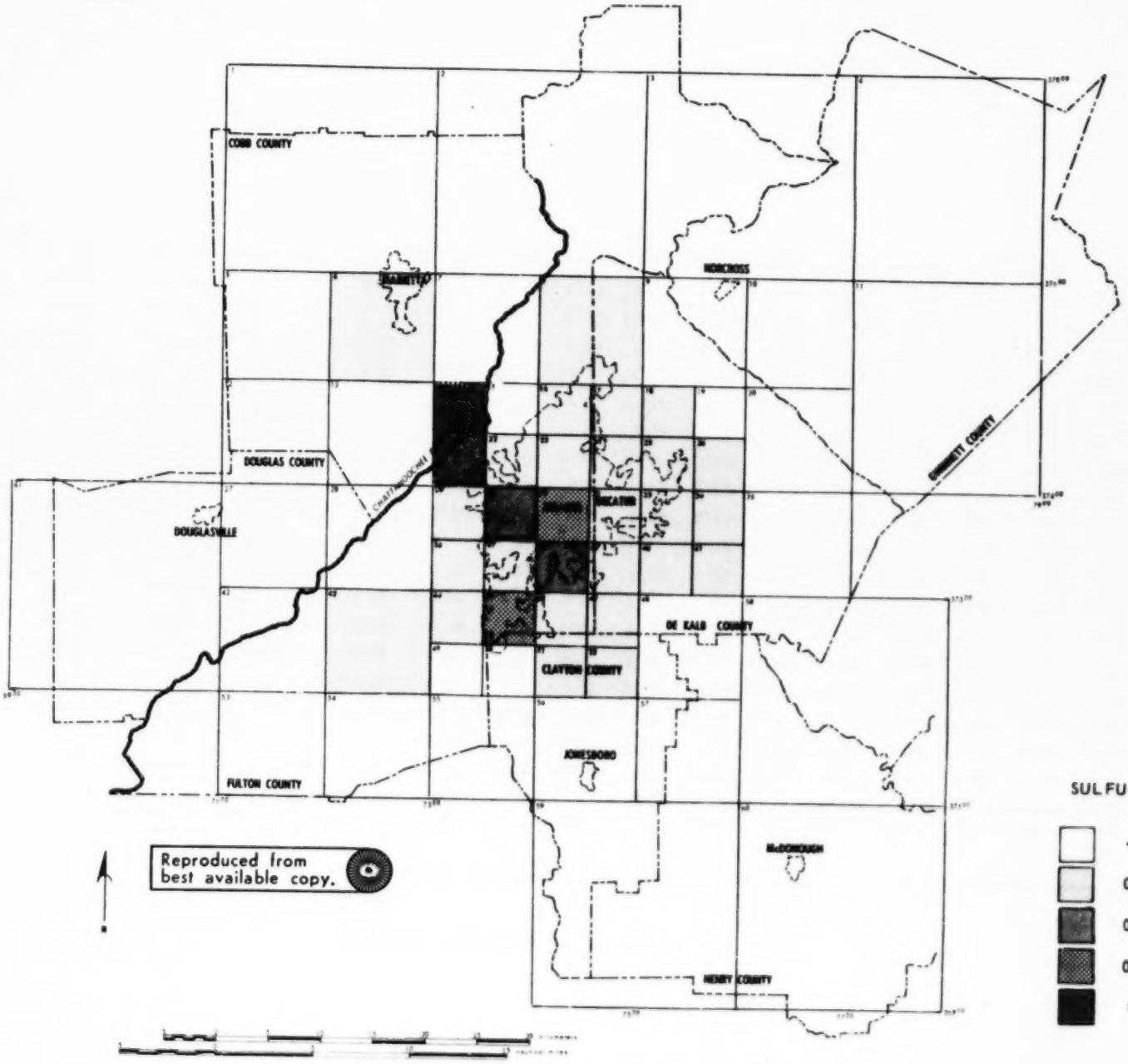


Figure 6. Sulfur oxide emission density map for Atlanta study area.

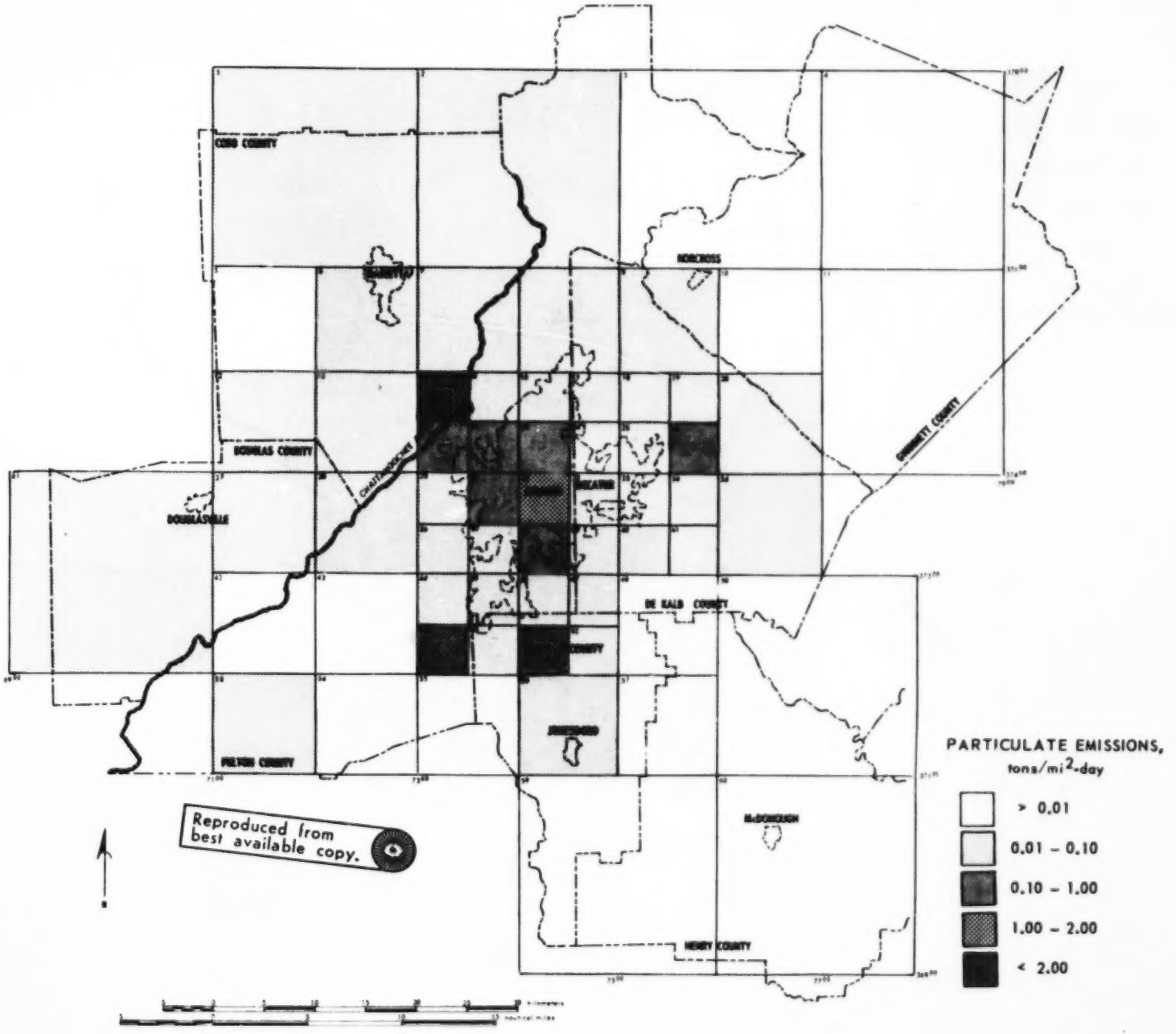
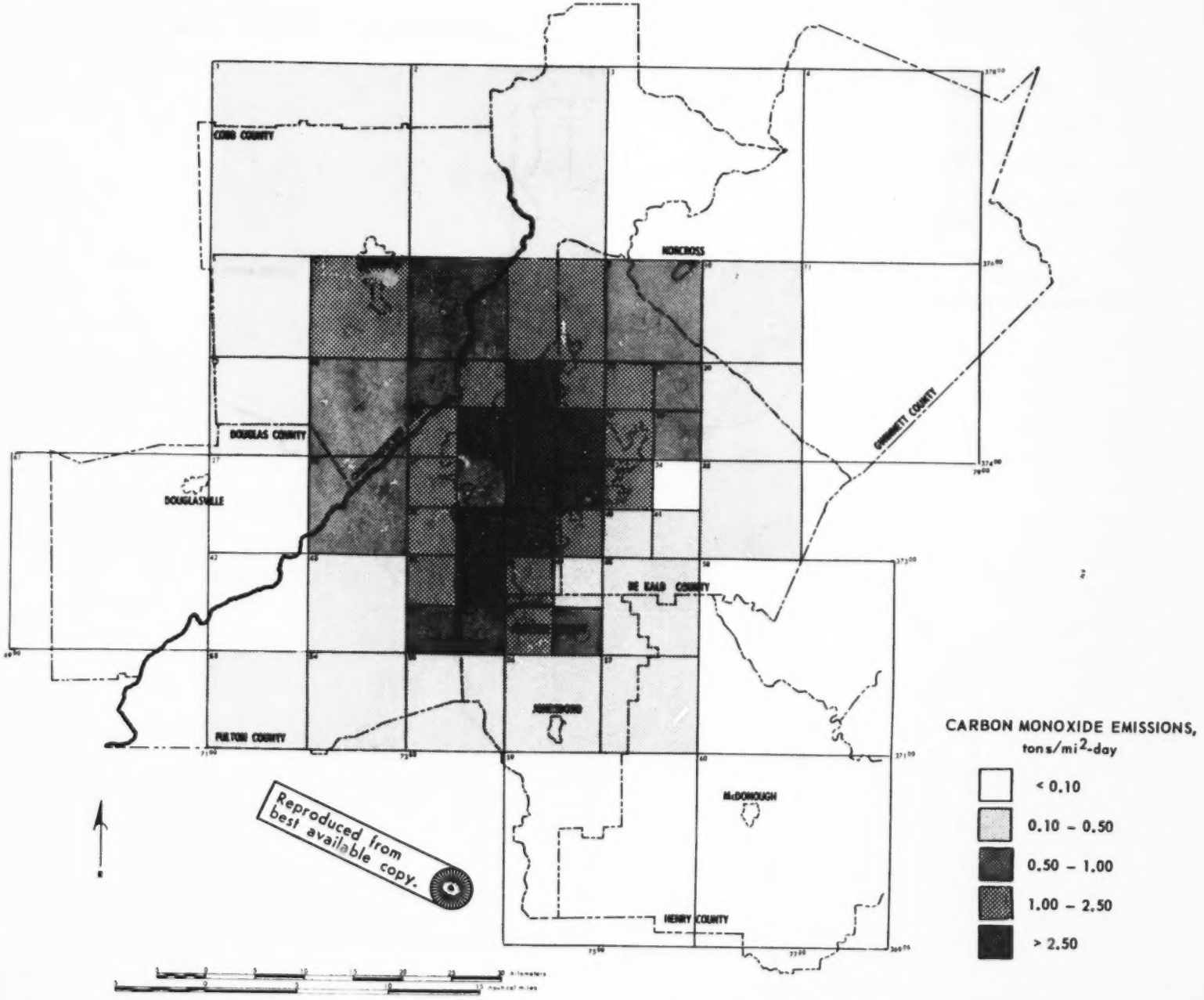


Figure 7. Particulate emission density map for Atlanta study area.



Reproduced from best available copy.

Figure 8. Carbon monoxide emission density map for Atlanta study area.

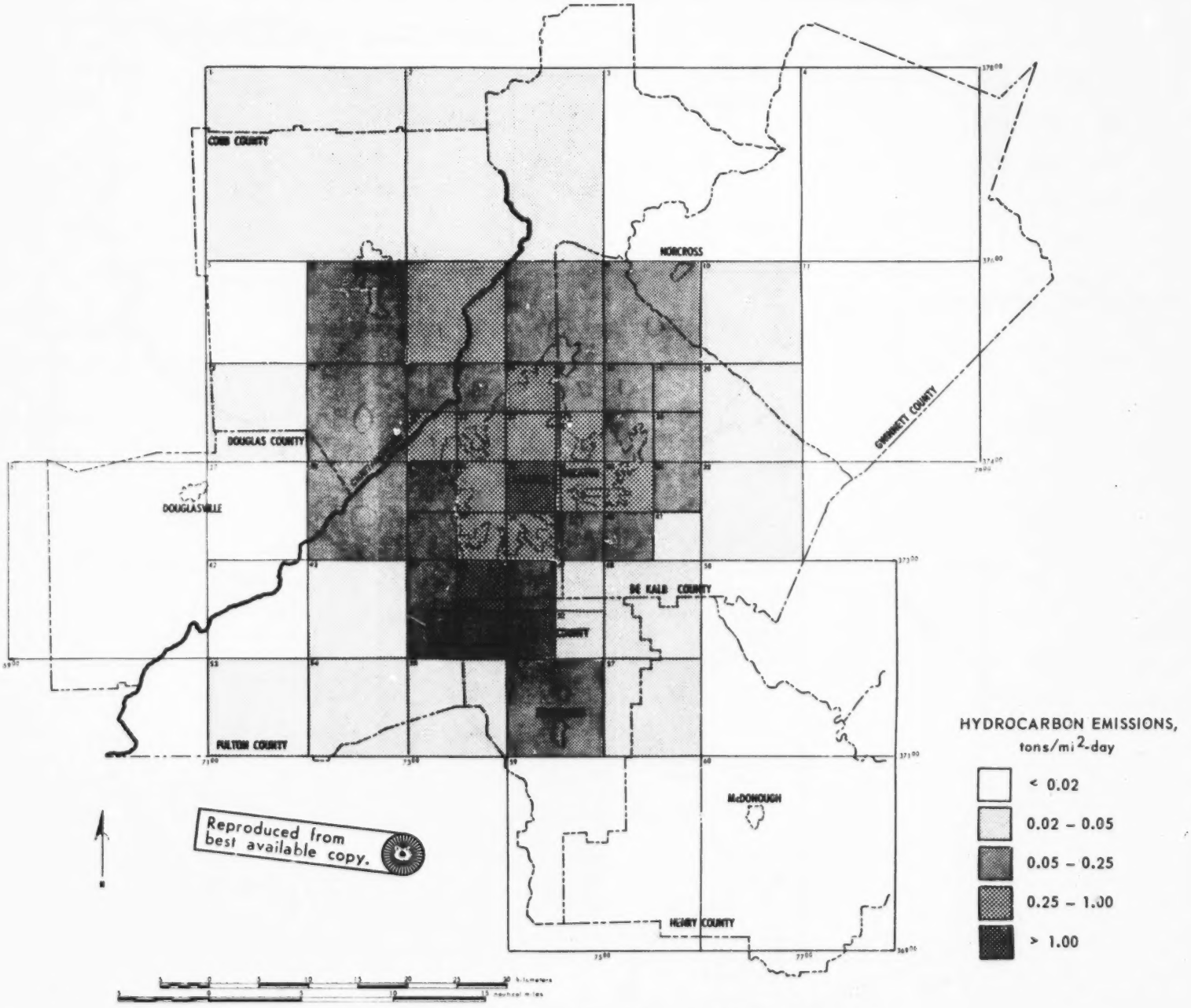
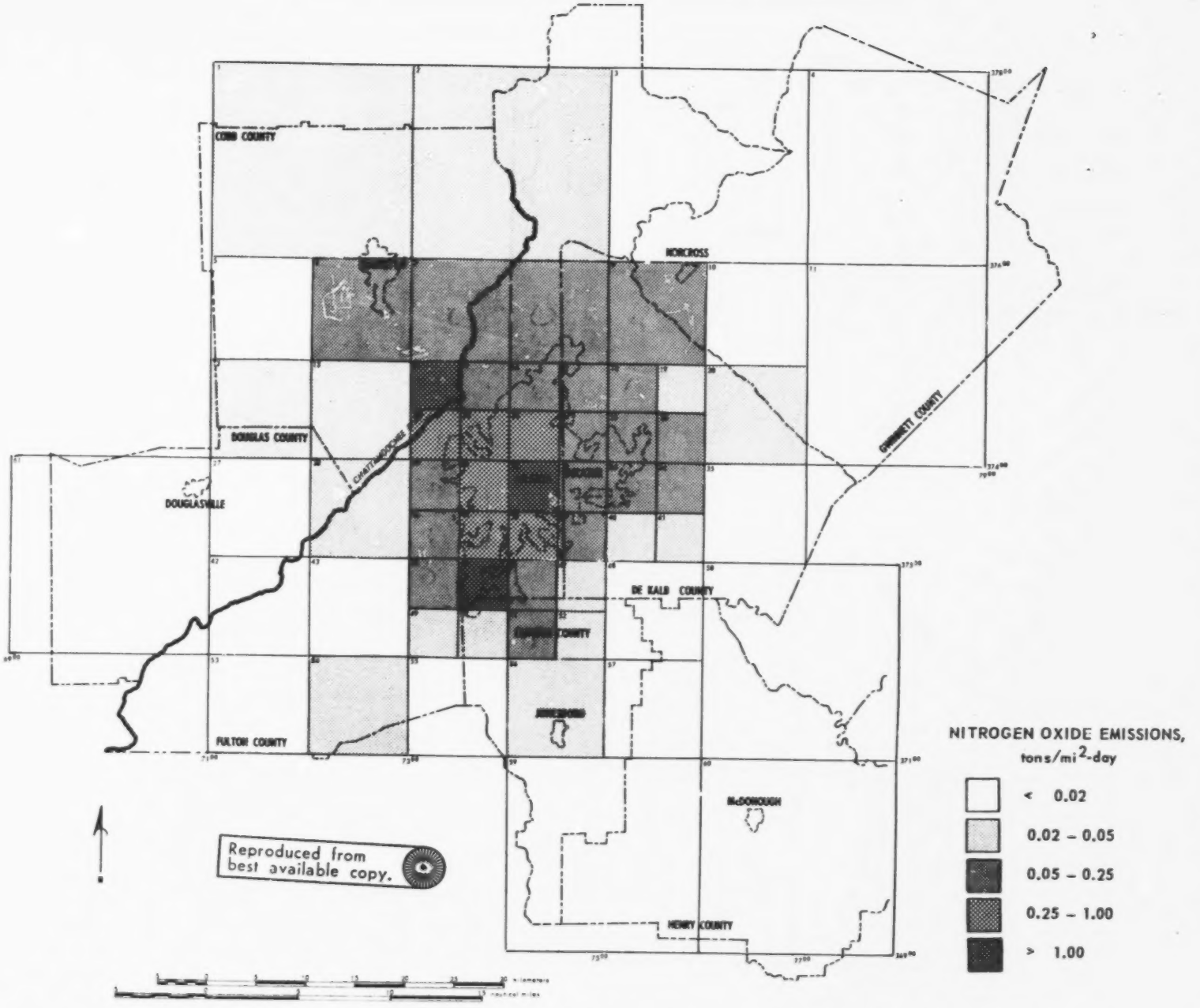


Figure 9. Hydrocarbon emission density map for Atlanta study area.



Reproduced from best available copy.

Figure 10. Nitrogen oxide emission density map for Atlanta study area.

REFERENCES

1. Ozolins, G. and Smith, R., Rapid Survey Technique for Estimating Community Air Pollution, DHEW, PHS, October 1966.

2. Duprey, R. L., Compilation of Air Pollution Emission Factors, DHEW PHS, April 1967.

3. Personal communication with the Fulton County Health Department, Section of Industrial Hygiene and Air Pollution Control.

4. Personal communication with Georgia Department of Health, Air Quality Control Branch.

5. FAA Air Traffic Activity, Calender Year 1967, Department of Transportation, Federal Aviation Administration.

6. Highway Statistics/1965, United States Department of Transportation.

7. Mineral Industry Surveys, Burner Fuel Oils, 1967, United States Department of Interior, Bureau of Mines.

8. Air Pollutant Emission Inventory Report for Fulton County, Georgia.